This data repository contains geodynamic model input files and output data for a paper entitled:

A tectonic-rules based mantle reference frame since 1 billion years ago – implications for supercontinent cycles and plate-mantle system evolution

R. Dietmar Müller[1], John Cannon[1], Michael Tetley[2], Simon E. Williams[3], Xianzhi Cao[5], Nicolas Flament[4], Ömer F. Bodur[4], Sabin Zahirovic[1], and Andrew Merdith[6]

[1]EarthByte Group, School of Geosciences, The University of Sydney, NSW 2006, Australia

[2]University of Texas Institute for Geophysics, Jackson School of Geosciences, The University of Texas at Austin, Texas, 78758, United States

[3]Department of Geology, Northwest University, Xi'an, 710069, China and EarthByte Group, School of Geosciences, The University of Sydney, NSW 2006, Australia

[4]GeoQuEST Research Centre, School of Earth and Environmental Sciences, University of Wollongong, Northfields Avenue, NSW 2522, Australia

[5]Frontiers Science Center for Deep Ocean Multispheres and Earth System; Key Lab of Submarine Geosciences and Prospecting Techniques, MOE and College of Marine Geosciences, Ocean University of China, Qingdao 266100, China

[6]School of Earth and Environment, University of Leeds, Leeds, UK.

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Contact: dietmar.muller@sydney.edu.au

Inputs and outputs of mantle flow models OPT1 and OPT2

Pre-processing.zip

This archive contains files used for pre-processing, i.e., creating files of thermal structure of the lithosphere and slabs, and tracer files. The codes used for pre-processing can be found here: https://github.com/EarthByte/citcoms/tree/master/pre_post_processing.
File "**config-template.cfg**" contains all essential parameters (e.g., slab dip angle) for pre-processing, and should run with script "Create_History.py".
File "**geodynamic_framework_defaults.conf**" contains paths to input files for pre-processing. The input files mainly include global crustal age grids and reconstructed coastline data.
The directory "**coord**" contains all coordinate files.

Input.zip

This archive contains input files for running mantle flow models OPT1 and OPT2.
"**OPT1.input**" contains input parameters for model OPT1
"**OPT2.input**" contains input parameters for model OPT2.
"**G5.coor.global.dat**" is radial mesh refinement file.
"**new_2p5_6_T-H15_G5_di_formatted.dat**" is the reference state file.
The version of CitcomS that was modified for progressive assimilation of surface boundary conditions from plate reconstructions can be found here:
https://github.com/EarthByte/citcoms.

Output Files

These are outputs of mantle flow models OPT1 and OPT2.
The archive "**OPT1_temperature_anomaly_grids_dimensional.zip**" contains dimensional temperature anomaly grids (NetCDF4 files) of model OPT1.
The archive "**OPT2_temperature_anomaly_grids_dimensional.zip**" contains dimensional temperature anomaly grids (NetCDF4 files) of model OPT2.
Each one of these archives contains a shell script entitled "dimensionalize_and_round.sh" that depends on the Generic Mapping Tools software. The script can optionally be used to convert dimensional into non-dimensional temperature anomalies.
The archive "**OPT1_3D_visualisation_ParaView.zip**" contains files required to visualise the evolution of mantle structure since one billion years ago predicted by case OPT1. The resolution has been decreased so that the visualisation can be carried out on a single processor. To open the visualisation, load the state file (StateFile/ OPT1-model.pvsm) in ParaView (ParaView 5.8.0 or later, make sure to select the option "Search files under specified directory" and select the directory containing the visualisation).

Cluster_maps.zip

The archive "Cluster_maps" contains present-day cluster maps for mantle flow models OPT1 and OPT2, as well as present-day cluster maps for the seven considered tomographic models. These cluster maps are provided as NetCDF3 files.